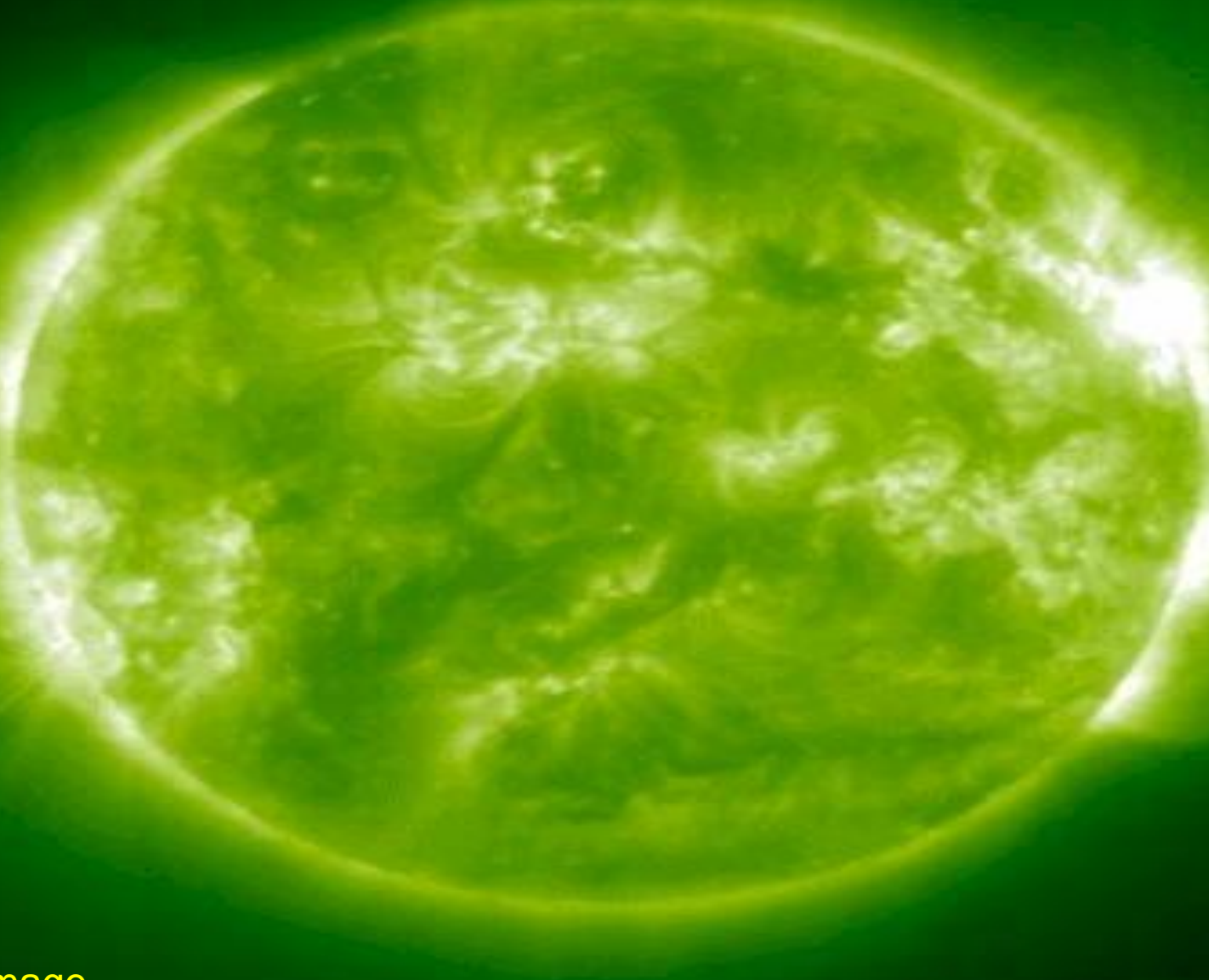


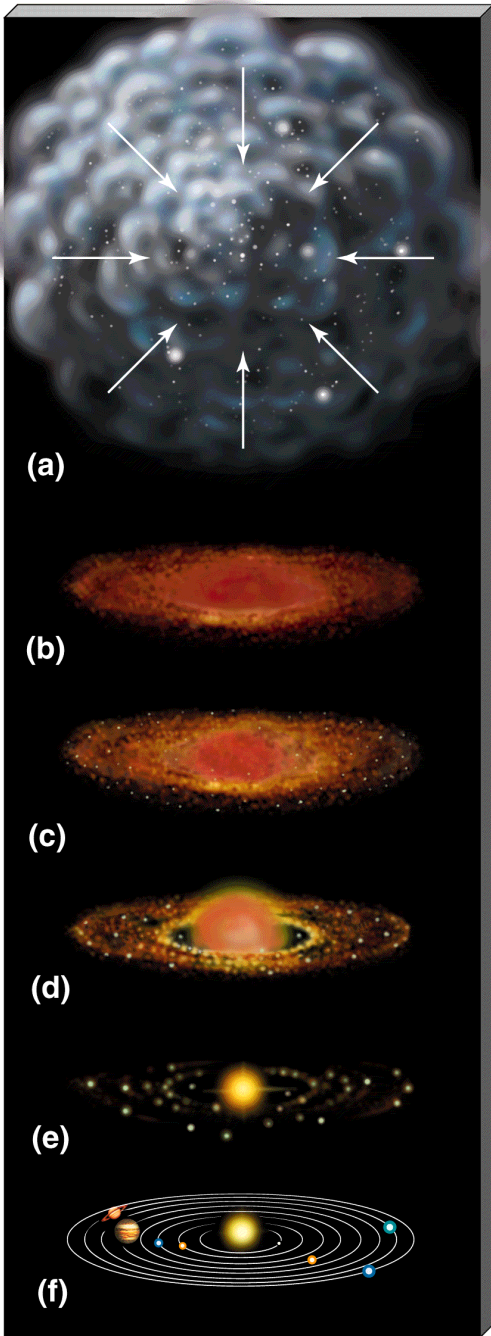
3.6 EXPLORING THE SUN



An x-ray image

2001/04/02 22:12

NASA/ESA/SOHO



<https://www.youtube.com/watch?v=Uhy1fucSRQI>

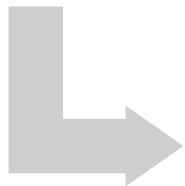
Where does the sun come from?

- **Solar Nebula Theory** = theory that describes how stars and planets form from contracting, spinning disks of gas and dust. (fig. 8.24 p.313)

Nebula

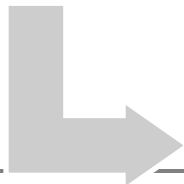
- a vast cloud of gas and dust, which may be the birthplace of stars and planets.

forms



Star

- a celestial body made of hot gases, mainly hydrogen, and some helium

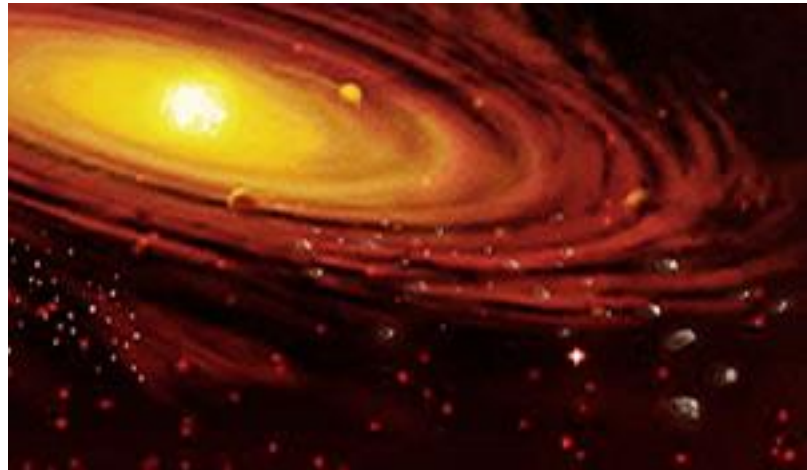


Planet

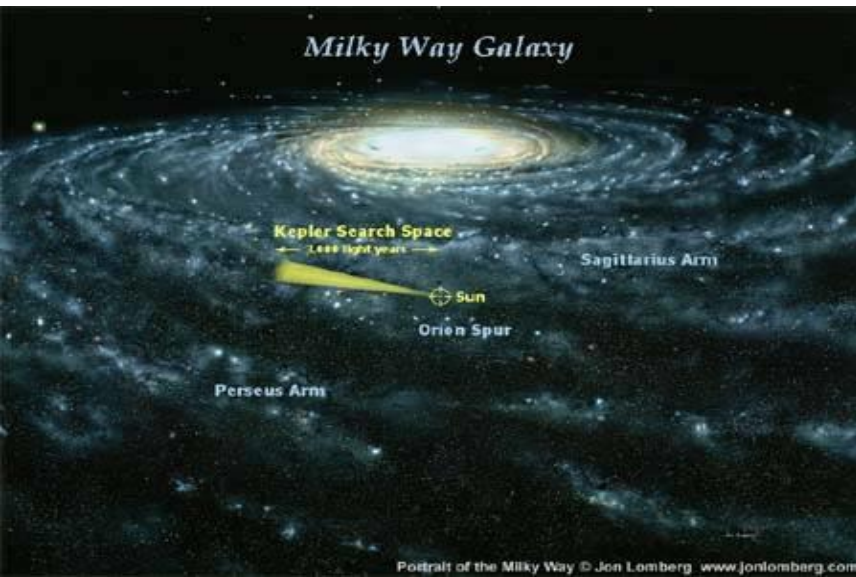
- Spinning particles of dust and gas slam into each other and stick together (like a snowball)

How did the Solar System Form?

- A **protostar** forms in the centre of a nebula
- Around the protostar dust particles form planetesimals which may become planets.
- Spinning mass flattens into a disk with planets orbiting on the same plane in the same direction



Exosolar planets



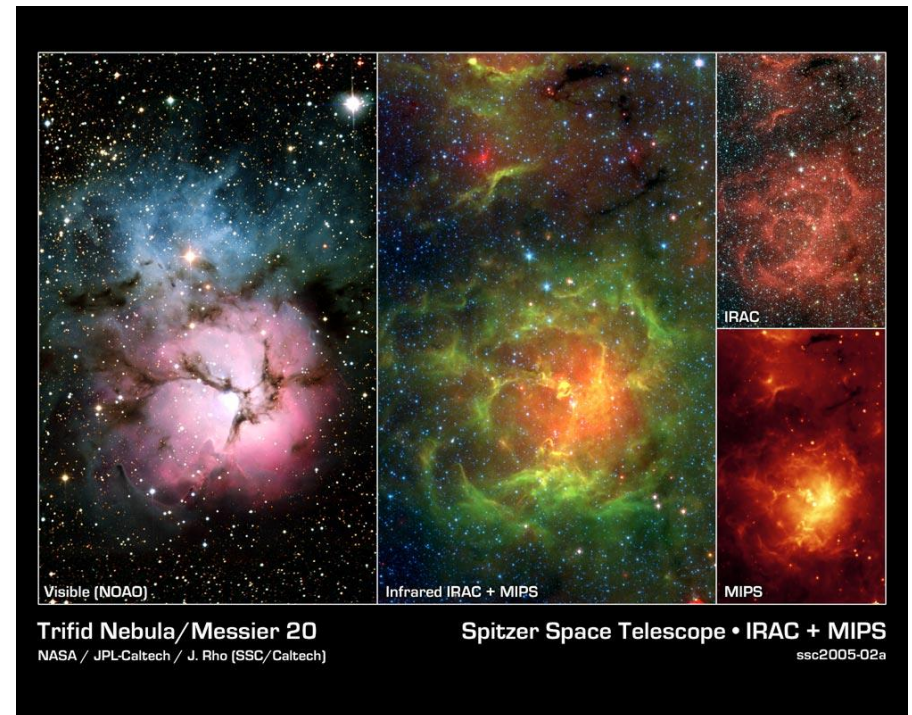
- A planet orbiting another star.
- Over 1000 discovered so far, there are probably millions.
- Often discovered by the changing light levels of a distance star as the planet orbits the star.



Formation of the Sun

1. A nebula collapses and contracts, the protostar reaches temp. of $10\,000\,000^{\circ}\text{C}$

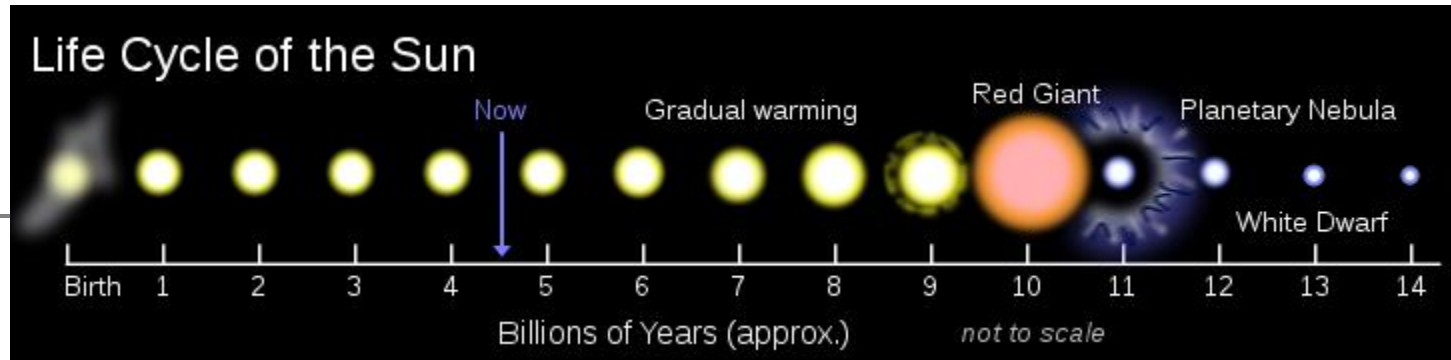
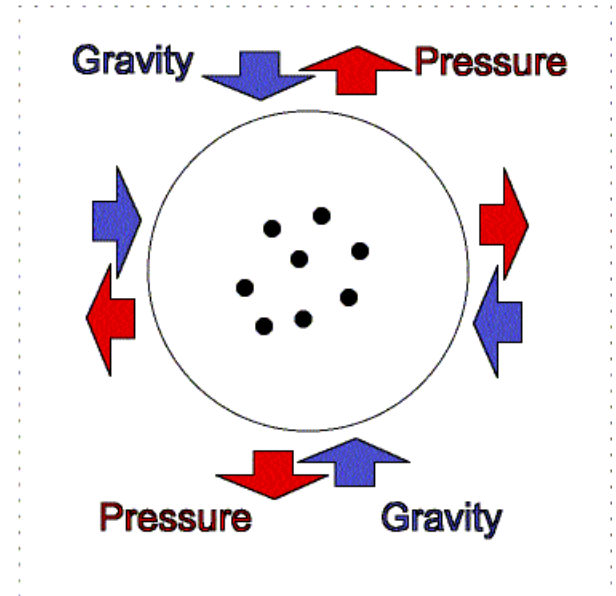
2. **Nuclear Fusion** starts in the core = hydrogen nuclei combine to form helium nuclei, energy produced.

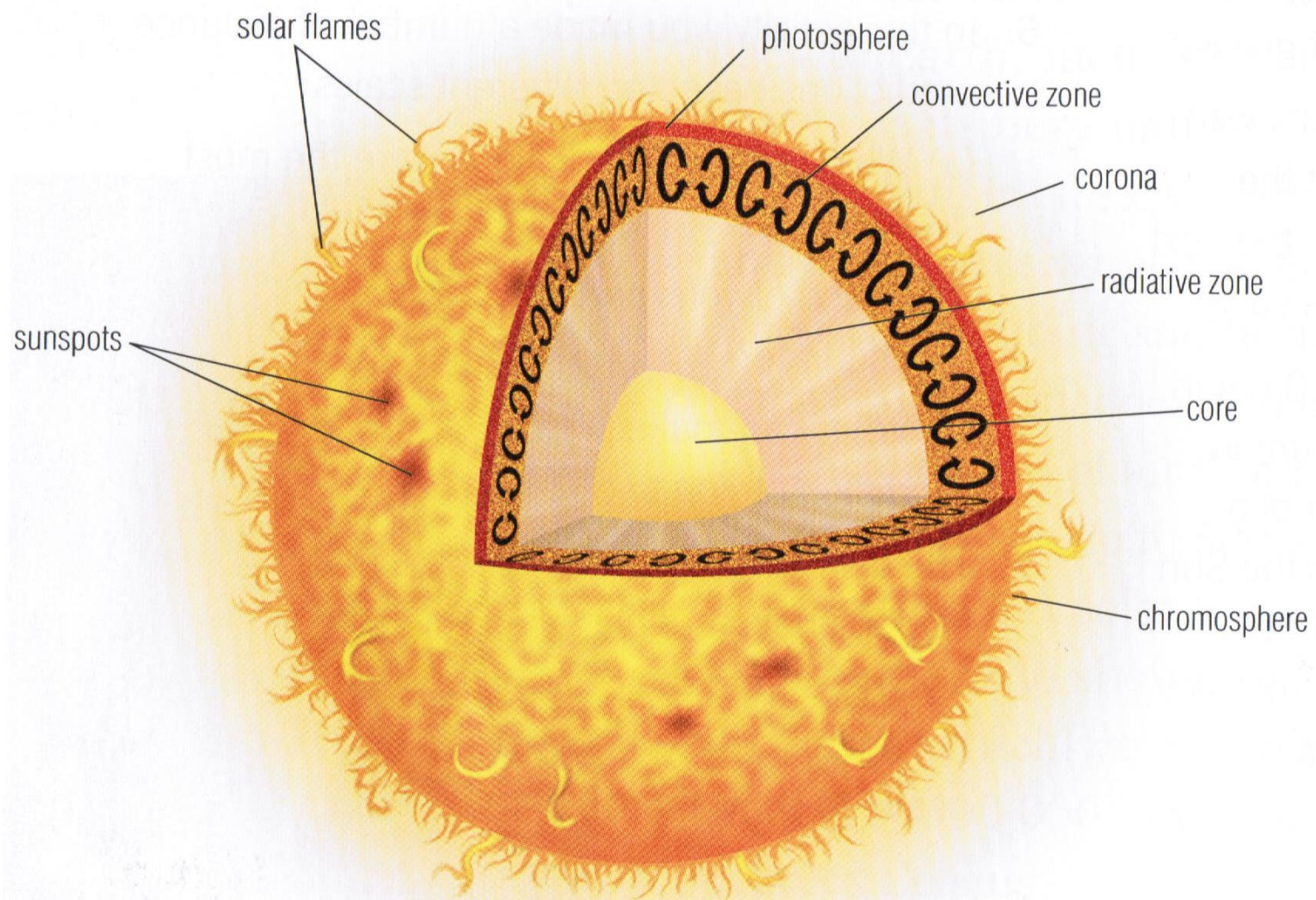


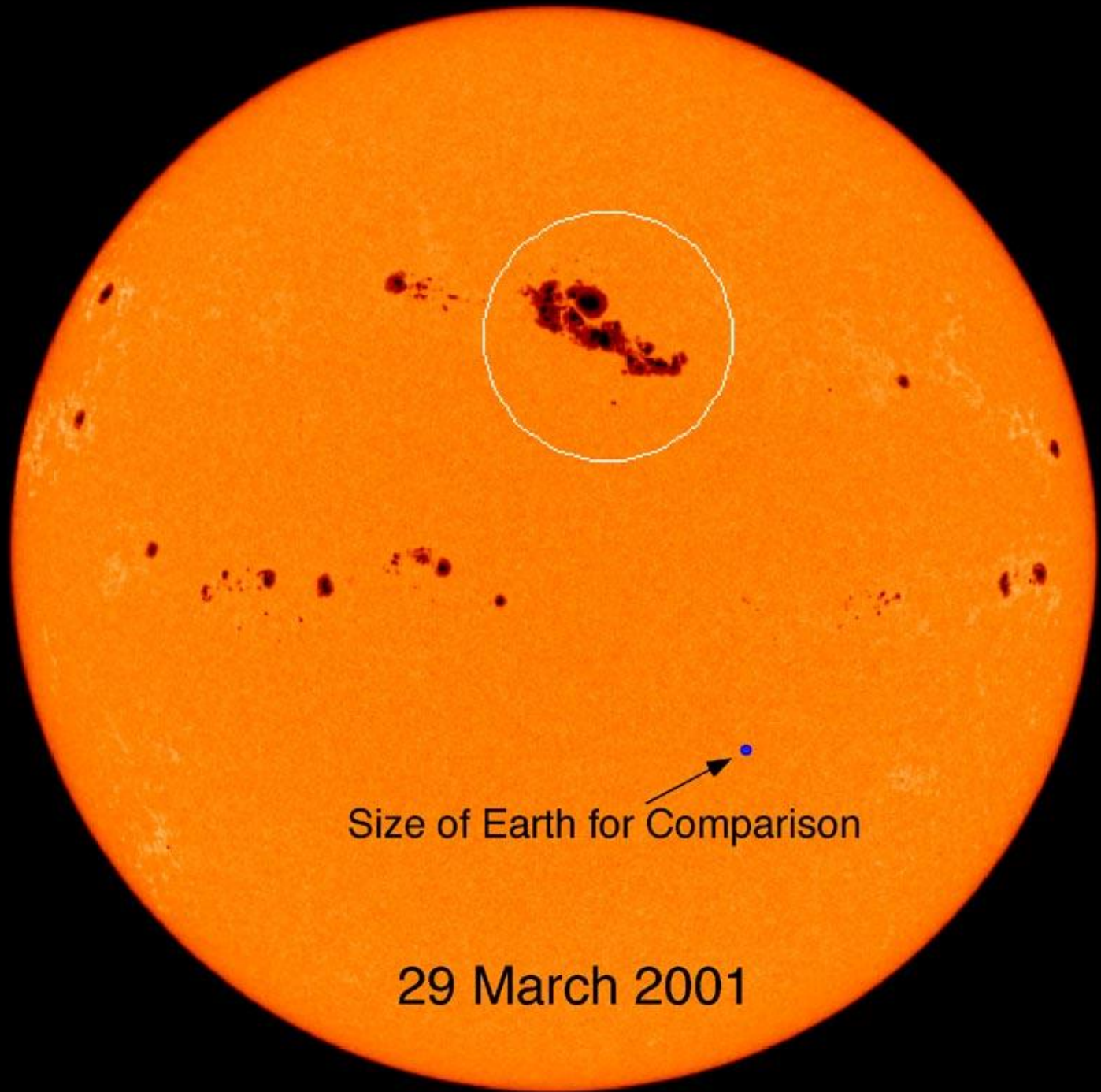
3. Helium builds up in the core, increases pressure for star to grow, but if this is balanced by gravity the star is stable (like our Sun now).

4. As helium builds up in the core, it enlarges, causing the sun to grow (in a few billion years)

5. Our sun (and our **solar system**) formed 5 billion years ago, it has grown by 30% and has only 5 billion more years left in its life!







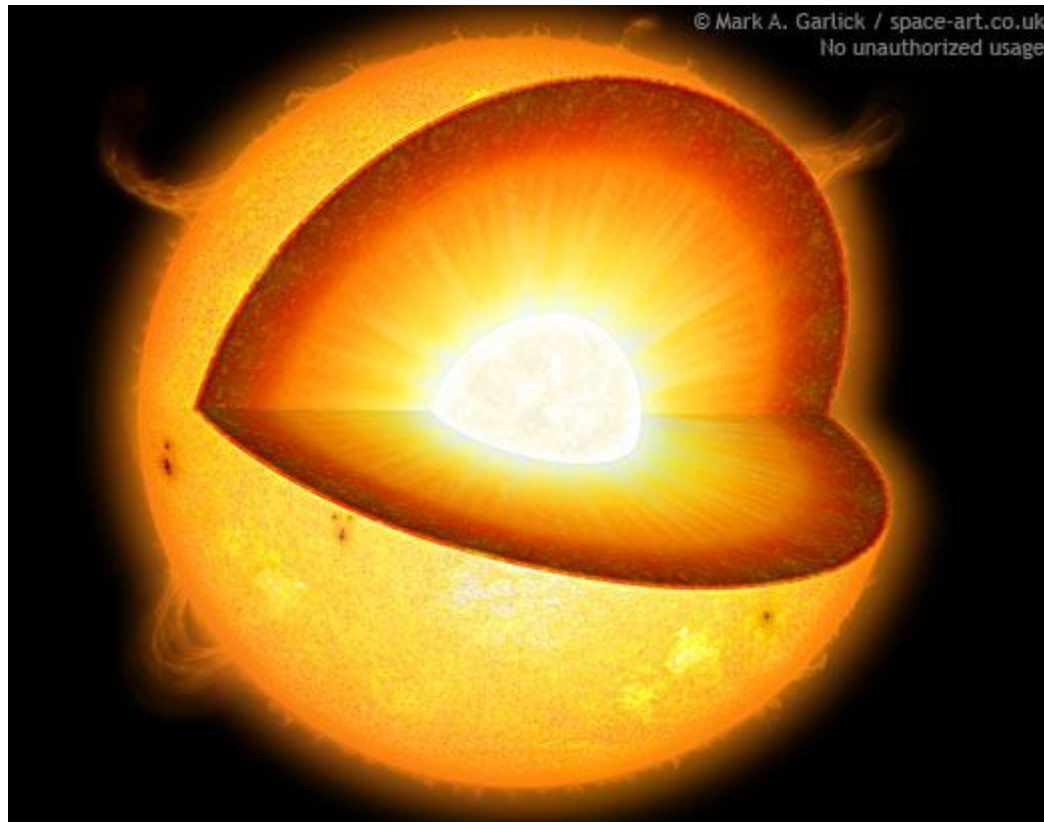
Size of Earth for Comparison

29 March 2001

Characteristics of the Sun

- **Photosphere:** “surface” of the Sun
 - **Sunspots:** actually brighter than the photosphere.
 - Informative about the sun’s rotation, the sun rotates faster at the equator than the poles!
 - Appear in cycles, as often as every 11 year
 - Solar **prominences** are streams of glowing gas that arch into space and then return to the Sun.
 - **Solar Flares/Solar Winds:** a stream of fast-moving charged particles ejected by the Sun into the solar system.
 - Cause → from an area of sunspots
 - Solar Winds that hit the Earth create **auroras** (and also damage electric equipment in space and electric grids on Earth)
 - North Pole = aurora borealis, South Pole = aurora australis
-

Draw and label:
Sunspot, solar flare, photosphere, core



How Big is the SUN?

Our Sun has a diameter of 1.4 million km and Earth a diameter of almost 13,000 km

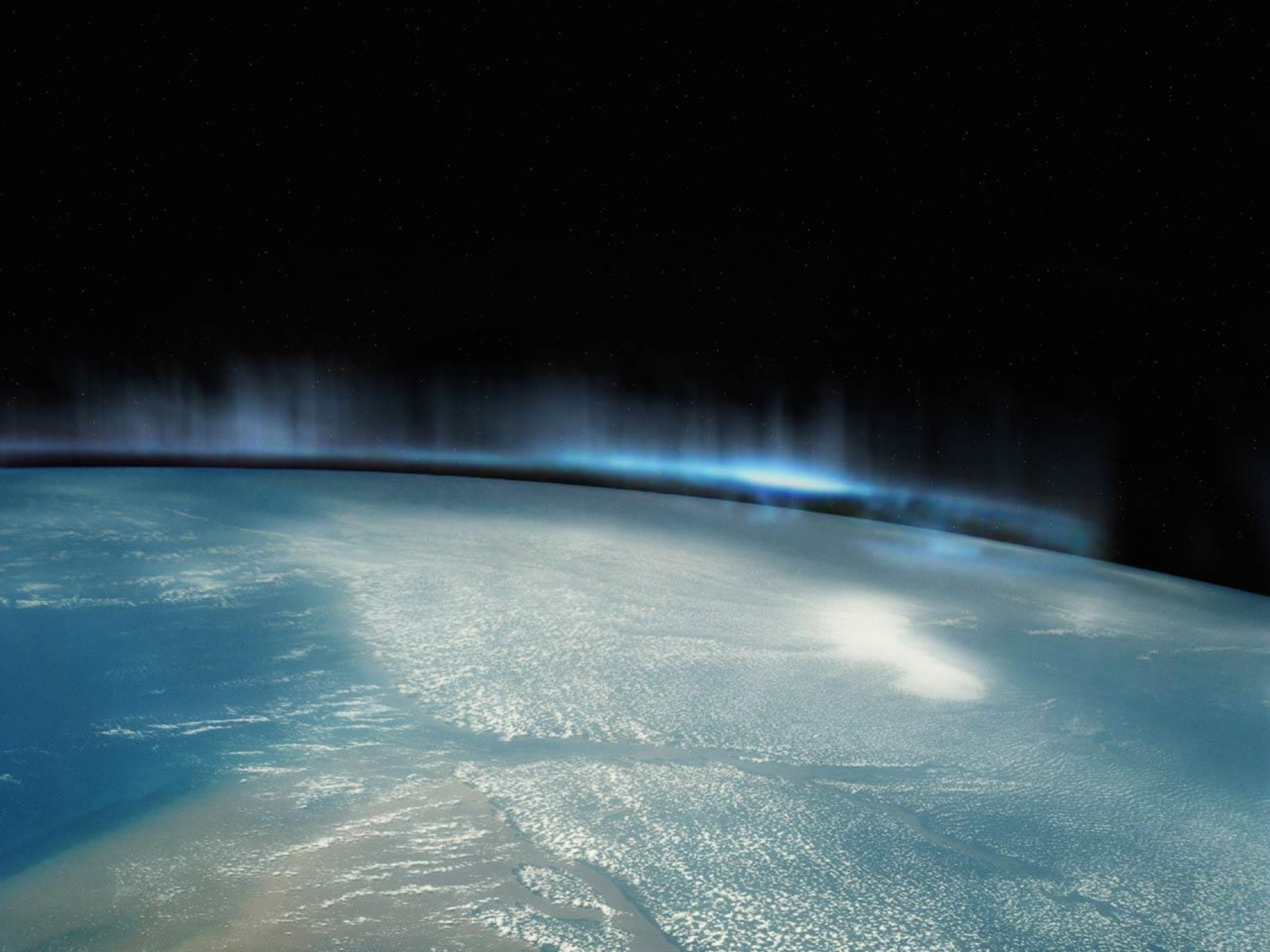
If the Sun were the size of an official league basketball, Earth would be a little dot no more than 2.2 millimeters

See how our Solar System's planets would look like in the same scale



Orbital distances are not depicted proportionally

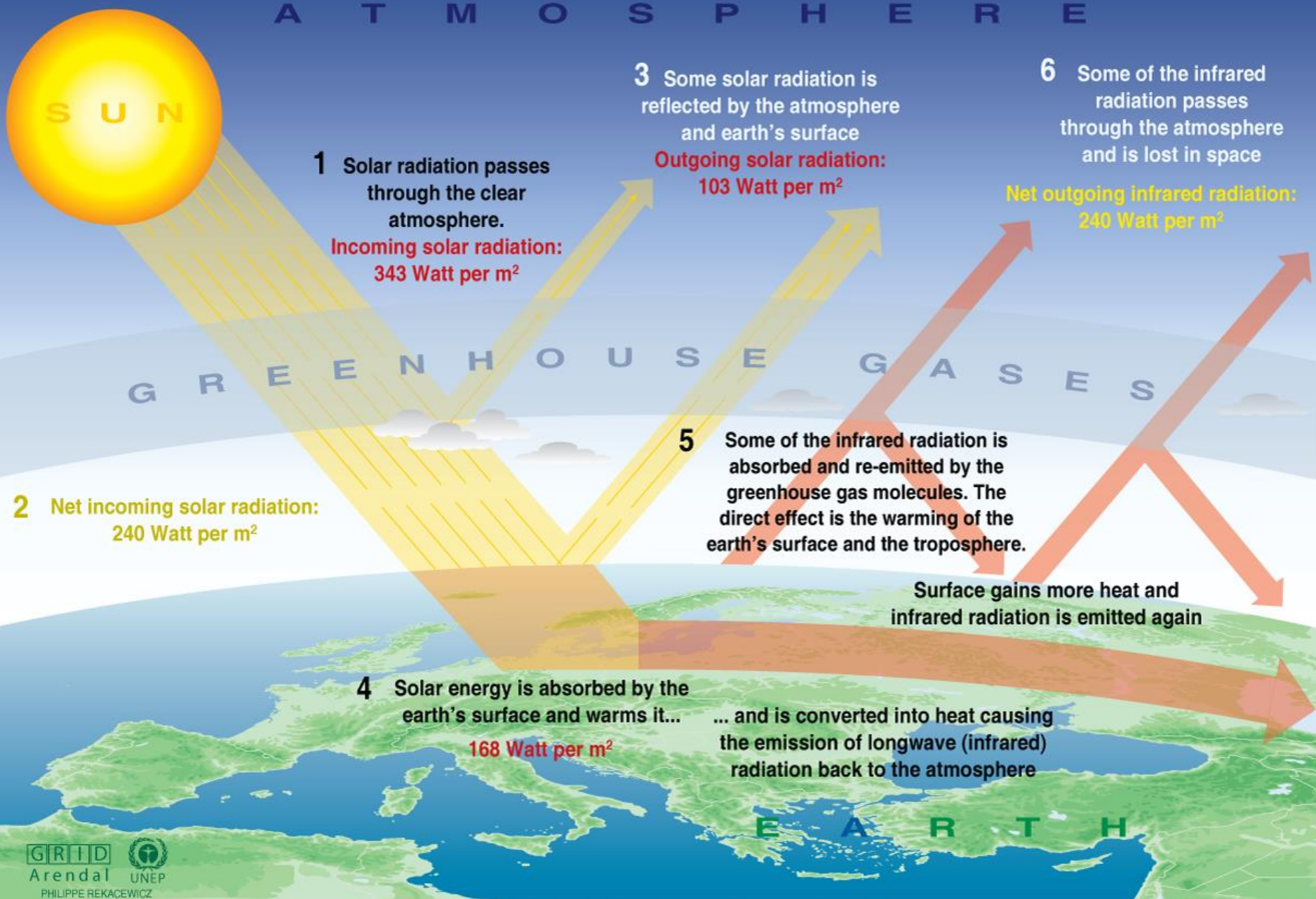




Importance of the Sun

- Basis for most life processes (animals & plants)
 - Light → photosynthesis → food chains
 - Generates winds and ocean currents
 - Absorbs wavelengths of radiation then emits radiation to atmosphere; this cycle warms the Earth
 - Greenhouse effect is very important, only to a certain point
-

The Greenhouse effect



Homework

- Read p. 306-311
- P. 311 # 1 to 5